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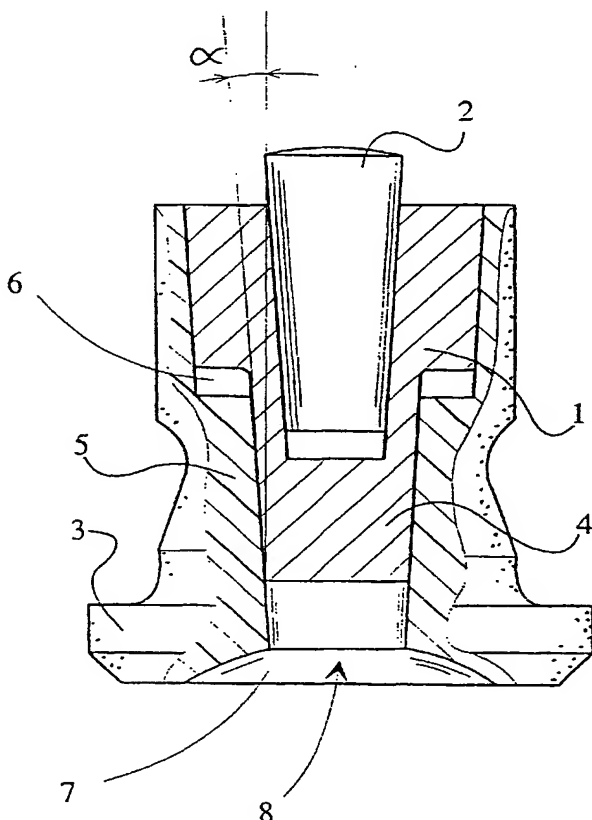
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(54) Title: **STUD FOR A TYRE**



(57) Abstract: The invention relates to a stud for a tyre comprising a socket-formed body portion (1), having at one end a hard metal peak (2) and at its other end a locking flange (3) retaining the stud in the tyre and being made of a light injection-mouldable material, such as plastic, the body portion (1) having a pin (4) extending towards the locking flange, with the tubular sleeve portion (5) of the locking flange fixed on top of this pin. The body portion (1) is conical so as to be clamped as a wedge into the corresponding conical sleeve portion (5).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Stud for a tyre

5 The invention relates to a stud for a tyre comprising a socket-formed body portion having at one end a hard metal peak and at the other end a locking flange retaining the stud in the tyre, and being formed of a light material such as plastic, the body portion having a pin extending towards the locking flange, with the tubular sleeve portion of the locking flange fixed on top of this pin.

10 As a rule, manufacturers of winter tyres seek to reduce tyre material, i.e. rubber mass, in order to achieve reduced weight of the mass that is without suspension in the car and thus enhanced road-holding characteristics. Winter tyres equipped with lighter studs also cause less wear to the road surface material. As a result of the manufacture of lighter winter tyres, the stud-locking flange gets very close to the
15 ply within a winter tyre. There is a distance of only 2-3 mm between the stud-locking flange and the ply. As a result of this, again, the edge of the stud-locking flange has entailed such heavy wear of the tyre rubber under the tilting movements of the stud that the internal ply has been damaged and even the tyre punctured.

20 There have been constant efforts to provide a stud solution that is durable while being as light as possible. Plastic and aluminium studs are known, but they have poorer resistance than studs with a steel body.

25 Gravel and asphalt dust cause very rapid wear of the plastic or aluminium body surrounding the hard metal peak, so that the hard metal peak may easily come off.

Such studs have been disclosed e.g. by FI patent specification 77409 and US patent specification 3,831,655. The stud described in FI patent specification 77409 is constituted of a metal stud body, around which a collar portion has been attached, with
30 the stud flange portion formed at the lower end of the collar portion. This type of stud involves the problem of the metal stud body being strongly tapered towards the stud flange portion. When the stud is then subjected to pressure in a direction parallel to the vertical axis of the stud, the metal stud body will act as a wedge that causes enlargement of the plastic collar portion. In the course of time, the plastic
35 collar portion will be enlarged to an extent such that the metal stud body is detached from the collar portion.

- US patent specification 3,831,655 discloses a stud, in which a shank portion made of metal has been connected to the bottom portion made of an elastic material either by mechanical joining, gluing or vulcanising. In this stud model, the shank portion is clearly narrower than the bottom portion, so that the same apparatus intended for mounting conventional studs cannot be used for mounting this stud. The elastic material of the bottom portion of the stud does not extend over the shank portion at all, or does so only over a short distance. This results in low friction between the stud and the tyre, so that the stud may be detached from the tyre.
- 10 The purpose of the invention is to provide a stud of a new type, which is both resistant and light. The stud of the invention is characterised by the body portion being conical, so that it is clamped as a wedge into the corresponding conical sleeve portion.
- 15 The invention provides a very lightweight stud with adequate durability characteristics. The weight of the stud may be even less than half of the weight of a steel stud of equal size. The stud causes less wear to the road surface. The stud is more silent, since it has lighter weight. The flexible locking flange is substantially retained in position despite the tilting of the stud. Since the actual appearance and dimensions of the stud do not differ from those of conventional steel studs, the studs can be fixed in the tyres using existing operational equipment. Given the small size of the metal body portion, there will be very low waste percentage of raw material if the manufacture is carried out using turning. In addition, the plastic part has proved to withstand abrasion against rubber better than a steel stud, and consequently the stud is better retained in the tyre.

Various embodiments of the invention are defined in the dependent claims of the set of claims. The locking flange can receive forces exerted on the hard metal peak of the stud, especially when the road surface is molten and the stud peak cannot bite into the snow mass or the ice surface.

The invention is explained below by means of examples and with reference to the accompanying drawing, whose figure shows the stud in partial cross-section.

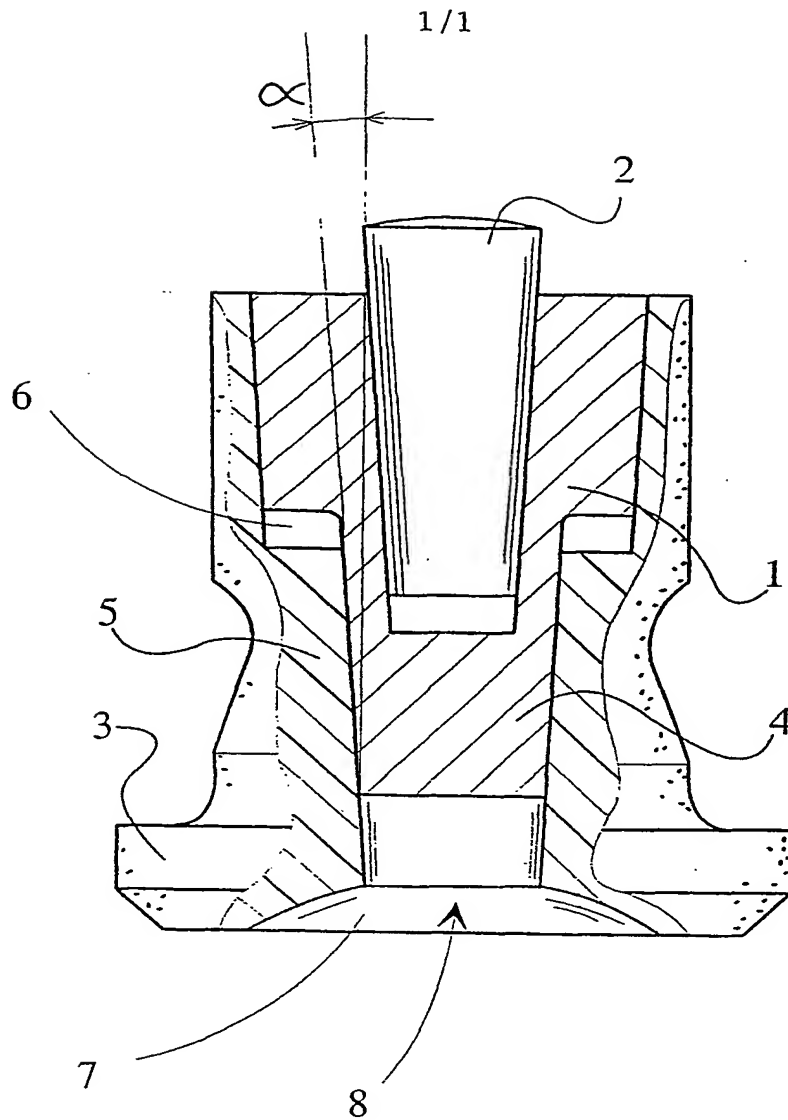
- 35 The stud consists of a socket-formed body portion 1, having a hard metal peak 2 at one end. At its other end, the body has a locking flange 3 retaining the stud in the tyre. The locking flange 3 is made of plastic. The stud body portion 1 has a pin 4 extending towards the locking pin, the tubular sleeve portion 5 of the locking flange

being fixed on top of this pin. The body portion 1 is conical so as to be clamped as a wedge into the corresponding conical sleeve portion 5. The body portion 1 has a graded conical surface, its diameter being larger at the hard metal peak 2 than its end 4 at the locking flange 3. At the graded location of the conical surface of the
5 body portion 1 and the conical surface of the sleeve portion 5, there is a hollow annular space 6, which allows the body portion 1 to be wedged deeper when pressing forces are exerted on the stud. The graded feature prevents the body portion 1, if loosened, from being unintentionally pressed into the tyre of the vehicle and causing puncture of this. The end of the sleeve portion 5 is open at the locking flange so as
10 to allow the body portion 1 to be wedged into it. The locking flange 3 has a convex recess 7 on its outer surface. The conical angle α relative to the central axis is 3 °.

The body portion 1 of the stud is not necessarily graded, it may equally well be an even cone, however, in that case, the open space 8 requires a collar to prevent the
15 body portion from being pressed through the sleeve portion 5 into the tyre of the vehicle.

Claims

1. A stud for a tyre comprising a socket-formed body portion (1) having at one end a hard metal peak (2) and at the other end a locking flange (3) retaining the stud in the tyre, and being made of a light material such as plastic, the body portion (1) having a pin (4) extending towards the locking flange, with the tubular sleeve portion (5) fixed on top of the locking flange, **characterised** in that the body portion (1) is conical over substantially its entire length so as to be clamped as a wedge into the corresponding conical sleeve portion (5).
2. A stud as defined in claim 1, **characterised** in that the conical surface of the body portion (1) is graded so that its diameter is larger at the hard metal peak than its end (4) at the locking flange (3).
3. A stud as defined in claim 1 or 2, **characterised** in having a hollow annular space (6) at the graded location of the conical surface of the body portion (1) and the conical surface of the sleeve portion (5).
4. A stud as defined in any of the preceding claims, **characterised** in that the end of the sleeve portion (5) is open at the locking flange (3).
5. A stud as defined in any of the preceding claims, **characterised** in having a concave recess (7) known *per se* on the outer surface of the locking flange (3).
6. A stud as defined in any of the preceding claims, **characterised** in that the conical angle relative to the central axis is 3 °.
7. A stud as defined in any of the preceding claims, **characterised** in that the outer surface of the sleeve portion (5) is roughened.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B60C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 2117151 A (STAHLGRUBER, OTTO GRUBER & CO.), 19 October 1972 (19.10.72), figure 1 --	1,2
X	FR 2753134 A1 (UGIGRIP SARL SOCIETE A RESPONSABILITE LIMITEE), 13 March 1998 (13.03.98), figure 8, abstract --	1,2
A	FR 2775934 A1 (UGIGRIP SARL SOCIETE à RESPONSABILITE LIMITEE), 17 Sept 1999 (17.09.99) --	1-7
A	US 3831655 A (RUDOLF CANTZ), 27 August 1974 (27.08.74) --	1-7

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4844137 A (EINAR EINARSSON), 4 July 1989 (04.07.89) -----	1-7

Form PCT/ISA/210 (continuation of second sheet) (July 1998)

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Information on patent family members

01/05/02

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Patent document cited in search report			Publication date	Patent family member(s)	Publication date
DE	2117151	A	19/10/72	NONE	
FR	2753134	A1	13/03/98	NONE	
FR	2775934	A1	17/09/99	NONE	
US	3831655	A	27/08/74	US 3911986 A	14/10/75
US	4844137	A	04/07/89	NONE	